



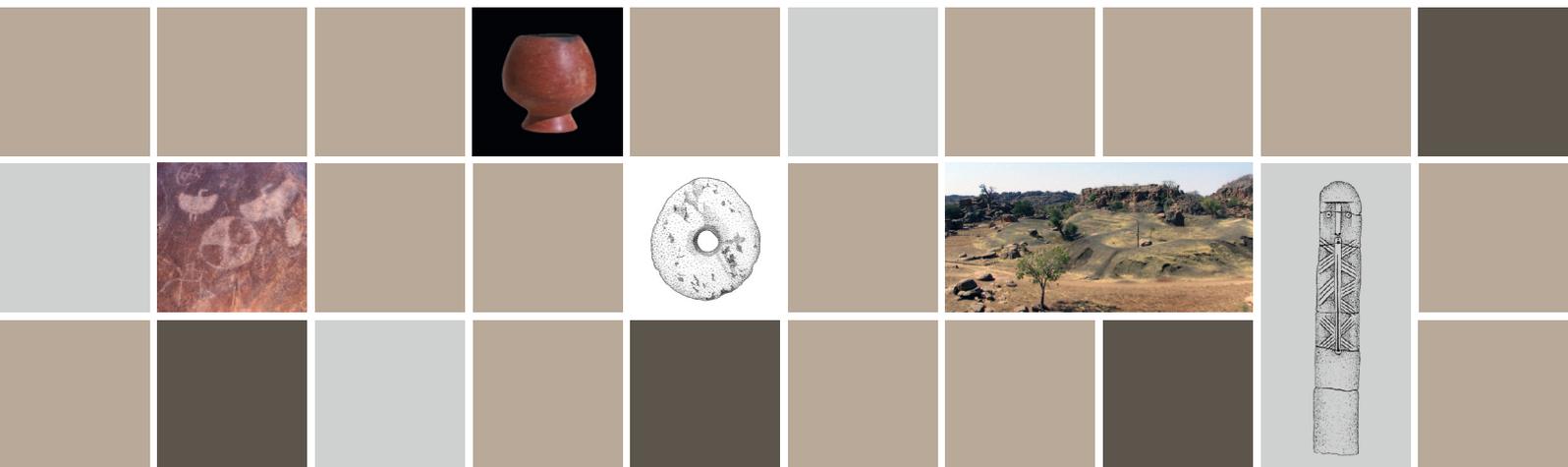
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Article outline

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Caroline ROBION-BRUNNER

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THE ROLE OF ETHNOHISTORIC DATA IN RECONSTRUCTING ANCIENT SIDERURGY IN DOGON COUNTRY (MALI)

Caroline ROBION-BRUNNER

Abstract

Since 2002, research on paleometallurgy in Dogon Country has revealed an exceptional history of siderurgical activity. More than one hundred smelting sites have been recorded, mapped and studied for the first time. Based on technological, cultural and economic criteria, we have attributed these sites to seven different siderurgical traditions. The existence and cohabitation of such diverse metallurgical remains within a limited geographic area (15 000 km²) are very surprising. In this paper, we attempt to interpret this archaeological observation with the aid of ethnohistoric data. Based on this comparison of several sources, we propose a new historic scenario retracing the evolution of the traditional production of iron in Dogon Country.

Keywords

Africa, Mali, Dogon Country, ethnohistory, archaeology, metallurgy, iron, blacksmith, caste, settlement.

As in most regions in western Africa, iron production in Dogon Country gradually ceased during the 20th century, being replaced by iron imported from Europe. Because this relatively recent activity is still present in the memory of Dogon people, it is possible to obtain ethnological and ethnohistorical data from the descendants of metallurgists and to compare them with archaeological observations.

As part of an interdisciplinary and international project entitled “Human populations and paleoclimatic evolution in West Africa”, directed by É. Huysecom, a section dedicated to paleometallurgy was initiated in 2002. Funded by the Fonds National de la Recherche Scientifique Suisse, its goal is to study the evolution of ironworking in Dogon Country from its origins to the present day (Serneels *et al.*, 2006; Robion-Brunner, 2008, 2010).

From the beginning of this programme, our field missions have revealed the exceptional history of Dogon siderurgy. For the first time, more than one hundred extraction and smelting sites have been recorded, mapped and studied. Distributed unevenly on the plateau, the Bandiagara cliff and the Seno plain, the very well preserved siderurgical remains are also very unusual. Based on technological, cultural and economic criteria, we have attributed these remains to seven ironworking traditions. The existence and cohabitation of such a high degree of diversity are very surprising.

We will attempt to interpret this archaeological observation in light of ethnohistoric data. Based on a comparison of several sources, we propose a new historic scenario retracing the evolution of traditional iron production in Dogon Country and discuss the role of ethnohistoric data in the analysis of archaeological remains.

1 - Dogon blacksmiths: a question of caste

Dogon Country, a region in Mali located to the east of the interior delta of Niger (figure 1), can be divided into four geographic zones: the plateau and cliff of Bandiagara, the plain of Seno and the sandstone massifs of Gourma (Daveau, 1959). Mainly inhabited by the Dogon, who are sedentary farmers, this region is distinguished by its linguistic division; it has 19 recorded languages (Hochstetler *et al.*, 2004; Blench, Douyon, 2006), in association with complex cultural interactions.

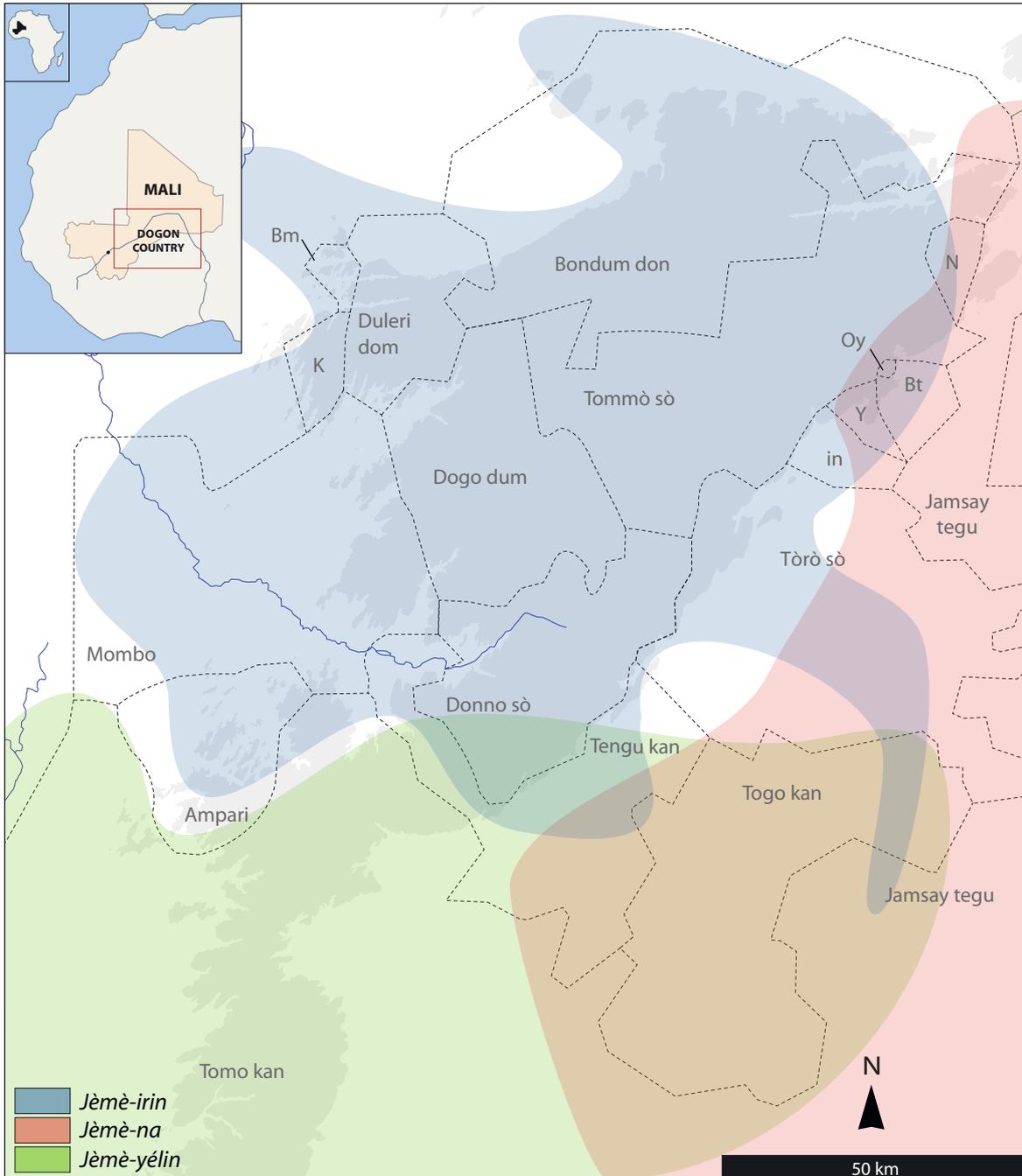


Figure 1 - Location of Dogon Country and the blacksmith castes residing in this region (CAD: C. Robion-Brunner).

Like many West African societies, Dogon society is stratified into three categories: farmers, specialised endogamous artisans, and slaves. There are currently three castes of blacksmiths: the Jèmè-na, the Jèmè-irin and the Jèmè-yélin¹. According to D. Paulme (1940), the Jèmè-na blacksmiths, located on the Seno plain, live in villages or neighbourhoods that are separated from the cultivators. They carried out the entire siderurgical production sequence, from iron ore extraction to the manufacture of finished products. The Jèmè-irin are located on the plateau and live among the farmers. They did not smelt iron ore, but bought it from the Jèmè-na to manufacture a variety of objects. The genesis of the formation of these two castes shows that the Jèmè-na peoples were the first blacksmiths in the region and that the Jèmè-irin were initially farmers, becoming ironworking specialists after an apprenticeship with the former. The third caste, the Jèmè-yélin, occupies the southern plateau and part of the Seno plain. They produced iron until the 1960s. In 1995, under the initiative of É. Huysecom, a group of blacksmiths from the Dogon village of Aridinyi restored a bloomery furnace and performed the various stages involved in siderurgy. This reactivation was the subject of a documentary film² that enabled researchers to observe and study the skills of the Dogon and to determine how beliefs and techniques interact in the process of transforming iron ore into finished products (Huysecom, 2001). Through this study, the history of the ancestors of the Jèmè-yélin was reconstructed. Originating in northern Guinea, they arrived in Dogon Country at the end of the 16th century (Huysecom, 2003).

2 - The seven Dogon siderurgical traditions

2.1 - The choice of classification criteria

Since the pioneering work of W. Cline (1937), many researchers have attempted to understand the astonishing variability of African siderurgical practices through the development of different typological systems. One of these systems is based on the morphology of the furnaces (Sutton, 1985; Martinelli, 1993; McNaughton, 1993); it takes into account the size, outline, superstructure, dimensions and shape of the furnace pit, the number of openings etc. Another system is based on the notion of technical choice and attempts to determine the technical mechanisms for iron smelting (Kense 1985; Pole, 1985; Tylecote 1987; Killick, 1991); it takes into account the presence or absence of a superstructure, the ventilation method and the type of slag produced. A third system attempts to define the social, political and economic organisation of siderurgical production (de Maret, 1980, 1985; Childs, 1991; Martinelli, 2002; Langlois, 2005-2006); it considers the social identity of the metallurgists rather than the skills developed.

1. According to G. Calame-Griaule (1968: 122), Jèmè is applied only to blacksmiths and designates the descendants of the first mythical blacksmith. This term is probably related to the Sonhay term *zèm*, “blacksmith”. The suffix *na*, which means “great” designates the members of this caste as the only real blacksmiths. G. Calame-Griaule (1968) believes that the suffix *irin* means “iron man” and that it was formed from *inune*, *ine*, “human being”, and *inu*, “iron”. G. Holder (1992: 59) clarifies this etymological explanation: “the term *irine* appears more likely to have been formed from an association of *iru* (milk, breast) and *ine* (iron, iron tools), thus referring to a specific relationship between dyèmè-na, the Great Blacksmith, he who has the knowledge, and the “mother”, from which the *irimbè* would have been nourished”. As for the term *yélin*, É. Huysecom offers two etymologies: either it would have come from the female name Yélin, designating the little sister of the first blacksmith of the Tomo people, or from the verb *yèrè*, which means “come” in tomo kan. This second linguistic origin would take into account the late arrival of this caste in Dogon Country.
2. Huysecom E., Agustoni B, 1996, *Inagina, l'ultime maison du fer*, Genève, Production Huysecom, Agustoni and PAVE, 52 min (VHS).

The classification criterion on which our study is based is technological in nature. Through a macroscopic and analytical analysis of metallurgical waste products it is possible to distinguish large families of furnaces based on the mechanisms of iron / slag separation and waste evacuation outside the smelting structure. Descriptions of slag are not sufficient to distinguish technical processes; a quantitative evaluation of each category of waste and the dominance of a particular type are necessary to identify the manner in which a bloomery furnace functioned. The morphological features, dimensions and types of construction can refine this classification. The architecture and the presence of certain features contribute essential elements to our understanding of the functioning of the furnaces. An analysis of their facies provides information on the cultural identity of the artisans. Quantitative criteria (waste volume, number of furnaces), in association with dates both absolute (radiocarbon dates) and relative (oral traditions), enable us to estimate when a workshop began to function, how it developed, its production level and its social and environmental impact. A reconstruction of the spatial organisation contributes to reconstructing the *chaîne opératoire* (and the spatial organisation and life of a workshop by defining the technical operations and additional structures (crushing and sorting of iron ore, fuel fabrication, raw material storage etc.). The geographic and linguistic data indicate whether the siderurgical sites are located in a restricted, large or dispersed perimeter, and whether they are integrated within specific regions.

2.2 - Description of the seven siderurgical traditions (table 1, figure 2)

Located on the western part of the Bandiagara plateau (Mombo linguistic zone), along the lower valley of the Yamé, the Fiko tradition is distinguished by its large mounds of metallurgical waste in the form of closed craters. Inside these heaps, walls are built to support the weight and maintain a cleared activity zone in the centre of which two connected furnaces are installed. These smelting structures are unusual in that they have a vast horseshoe-shaped pit (3 to 4 m³ of internal volume) and a large number of openings (figure 3). The metallurgical assemblage is mostly composed of tapped slag.

Table 1 - Summary table of principal characteristics for each of the Dogon siderurgical traditions (data: C. Robion-Brunner).

Metallurgical traditions	1 - Technological criteria			2 - Morphological criteria							3 - Economic criteria				
	Method	Slag		Shaft section	Opening			Stairs	Peep-hole	Construction materials	Spatial organization			Volume of waste dumps per site (order of magnitude)	
		External	Internal		Tuyere holes	Waste dump morphology	Number of furnace/dump								
	Slag separation	Large gas bubble	Large furnace bottom slag	Circular	Door	~ 20	No	No	Slag	Open dump	Scattered small dumps	1 furnace/dump	> 10000 m ³		
	Superstructure	Normal degassing	Vertical flow structure	Elliptical		8	Yes	No	Clay/brick	Closed dump		> 1 furnace/dump	1000 to 10000 m ³		
	Natural draft					6	No	Yes	Re-used tuyere						
						5	Yes		Sandstone block						
Fiko	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Ouin	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Ama	x	x	x	x	x	x	x	?	x	x	x	x	x	x	
Tinntam	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Aridinyi	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
Wol	x	x	x	x	x	x	x	?	x	x	x	x	x	x	
Enndé	x	x	x	x	x	x	x	?	x	x	x	x	x	x	

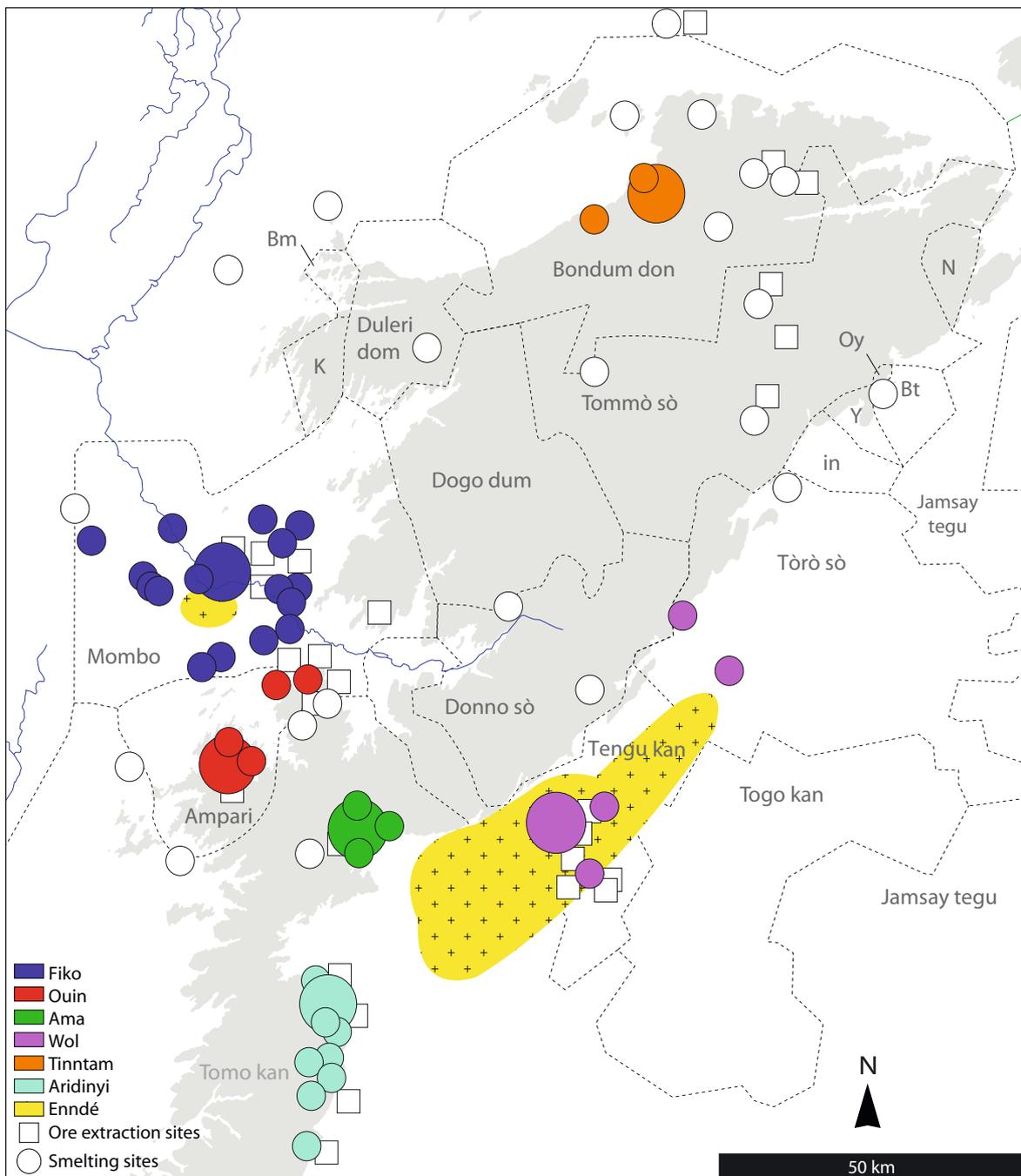


Figure 2 - Location of Dogon sites (extraction and smelting of iron ore) and siderurgical traditions (CAD: C. Robion-Brunner).

The Ouin tradition is found in the Pignari-bana region to the southwest of the plateau (Ampari linguistic zone). The metallurgical waste forms one or several low, open ring-shaped mounds, in the centre of which emerges a single furnace. This latter has walls forming a cone and a circular pit perforated at its base with eight openings and a door. The systematic use of lozenge-shaped bricks in the construction of the base of the superstructure is unique to this tradition (figure 4). The metallurgical assemblage is similar to that of the Fiko tradition, but the slag and the tuyeres are smaller.



Figure 3 - Toumpou, iron ore smelting workshop established at the foot of the abandoned village (after Serneels, 2009).



Figure 4 - Ouin, bloomery furnace (after Robion-Brunner, 2007).

The Ama tradition is located on the edge of the Bandigara cliff, west of Kani-Bonzon (Tomo kan linguistic zone). Its waste dump zones are highly organised spatially and are similar to those of the Ouin tradition. Bloomery furnaces have a circular pit pierced by five openings and a door. The walls are constructed with different types of materials (slag, re-used tuyeres and sandstone blocks). The metallurgical waste consists mostly of tapped slag whose specific morphology – hollowed slabs – indicates the formation of a gas bubble during the cooling phase.

The Tinntam tradition is found on the north east border of the Bandiagara plateau (Bondum don linguistic tradition). The spatial organisation of these sites is not standardised. They consist of one or several adjacent crater-shaped dumps with one or two bloomery furnaces in the centre (figure 5). The originality of these furnaces resides in the use of walls made of three successive layers: an internal coating composed of clay mixed with broken tuyeres, a central wall realised with the aid of thickened sandy slag, and an external pavement made of rectangular sandstone blocks. The waste products are mostly constituted of tapped slag with a slightly triangular section, suggesting that the material flowed outside the furnace, in a channel.



Figure 5 - Tinntam, mound of metallurgical waste (after Serneels, 2006).

The sites of the Aridinyi tradition are found along the cliff of the southern plateau (Tomo kan linguistic zone). The iron workers discarded the metallurgical waste around the bloomeries, sometimes constructing a network of narrow streets using the large blocks of furnace slag. The bloomeries are massive and have very thick walls made from slag. They are truncated and sit on six legs between which five openings and a door are located (figure 6). This tradition is characterised by large blocks of furnace slag that form in the furnace pit. They can weigh more than 80 kg.

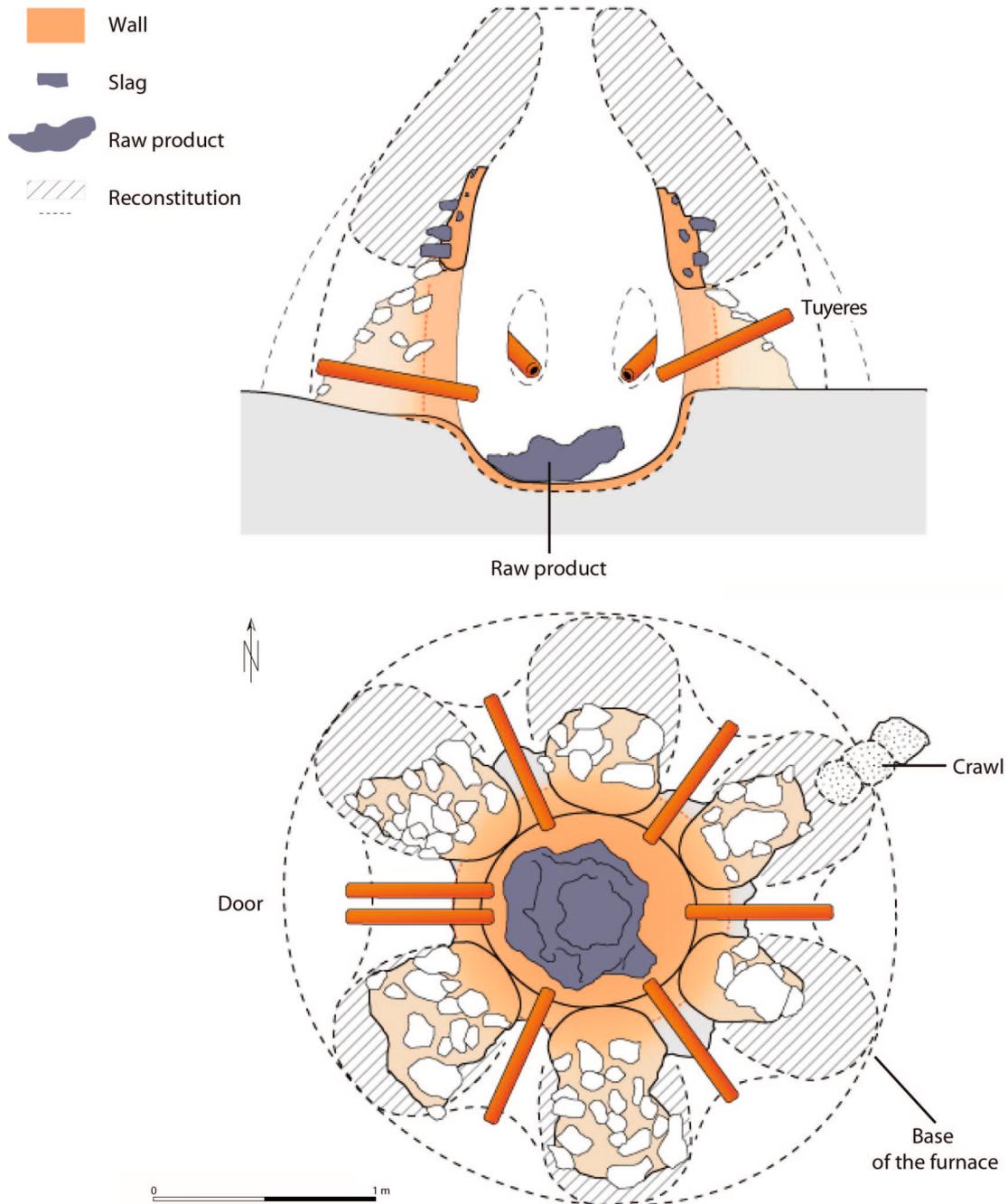


Figure 6 - Kobo, plan and section through bloomery furnace (CAD: S. Perret).

The Wol tradition, located at the foot of the Bandiagara cliff (Tengu kan and Tòrò sò linguistic traditions), is defined by the spatial organisation of waste into mounds. These are formed at the top of natural sand dunes. The architecture of the furnaces is still poorly known. These simple constructions have a cylindrical pit perforated with six openings and a door. Among the waste, slag in the form of cords is dominant; this is very similar to waste of the Ama tradition. The associated tuyeres often have a flat face.

The Enndé tradition has been identified in three linguistic zones (Tomo kan, Tengu kan and Mombo) respectively located at the foot of the cliff, in the northeast sector of the Seno plain and along the western margin of the plateau. The spatial organisation of these workshops consists of small piles of slag scattered in a thin layer, each associated with a furnace. The latter is partially buried in the ground. The thin wall of its chimney is slightly conical and composed of banco containing loose slag. It has a door leading into the bottom of the pit and five openings dug into the circulation ground level, located higher up. The slag of this tradition can be divided into two recurring facies: vertically flowing furnace slag and slag with irregular morphology.

2.3 - Similarities and differences between the seven Dogon siderurgical traditions (table 1)

From a technological perspective, all of the Dogon siderurgical traditions employ the direct method with slag and iron separation, their furnaces have a superstructure, and the combustion of charcoal is ensured by natural ventilation. A macroscopic and morphological study of the slag and a quantitative evaluation of the different types of waste products have allowed two methods for the evacuation of the latter to be distinguished. In the Fiko, Ouin, Ama, Tinntam and Wol traditions, the separation of slag and metal is lateral and tapped slag is dominant. In the Aridinyi and Enndé traditions, the separation is vertical and internal slag is dominant.

From a morphological point of view, the Dogon furnaces are architecturally very diverse. In a limited geographic zone, the siderurgists were dynamic and creative in the realisation of smelting structures. In most cases, these had a pit with a circular section, a door for the evacuation of slag and the raw product, and were constructed using slag. Nonetheless, the number of openings, the presence or absence of steps or a peephole and the nature of the construction materials differ. Finally, none of the traditions have exactly the same smelting structure.

From an economic perspective, the spatial organisation and the volume of slag indicate high variability in the rate and intensity of production. The siderurgical sites are generally composed of one or several central concentrations from which a furnace emerges. The Fiko tradition, however, is distinguished by its sites composed of enormous craters of waste totalling approximately 300 000 tons. The majority of sites from the Ouin, Tinntam, Wol, Ama and Aridinyi traditions have a volume between 1 000 and 10 000 tons. The location, spatial organisation and quantity of waste products of the Enndé tradition indicate sites with a lower degree of iron ore smelting composed of small piles of scattered slag.

3 - The identity of the metallurgists

Before attempting to interpret the variability of the siderurgical remains based on the history of human settlement in the region, it is important to define the identity of the people involved in iron production. We must first remember that metallurgy in Dogon Country was an exclusively male domain. The taboo of iron ore is with its red colour, which, by extension, touches upon all objects or materials of this colour. Since the life of a woman follows the rhythm of blood (menstruations,

loss of virginity, pregnancy), she could not take part in the extraction of ore, the process of smelting, or forging (Herbert, 1993). Women were not allowed to approach ore for fear that it would “flee”.

3.1 - The identity of the metallurgists by technological phase (table 2)

The extraction sites fell under the jurisdiction of the master of the land, who was a descendant of the village founder, and thus usually belonged to the social class of farmers. All men were allowed to work in the mine, whether they were blacksmiths or farmers. Propitiatory declarations, blessings and sacrifices, made by the master of the land, preceded the beginning of operations. These were intended to protect the miners from the numerous dangers and accidents associated with the underground extraction of iron ore. The master of the land thus had both secular and magical powers. The supervision of the work – coordination of the teams, choice of sectors, selection and sorting of iron ore – was carried out by the master of the mines. This strategic position was usually bestowed upon a blacksmith. Though technically rather simple, mining required a large number of workers that the blacksmiths, who were often few in the village, could not provide without the contribution of young farmers.

Located near the habitations, the smelting sites fell under the combined responsibility of the lineage chiefs of the village. The master of the furnaces, on the other hand, was a blacksmith who belonged to the generation of the elders. He oversaw the smelting operations, ensured the execution of sacrifices and the direction of propitiatory ceremonies. In contrast to what can be observed for the forge, there was no single possessor of technological knowledge. The mastery of the chemical and physical process by which the iron ore was transformed was acquired collectively: the master of the furnaces directed the operation from a magical perspective, while a group of elders discussed the technological procedure. The confusion between landholder and possessor of magical or technological knowledge sometimes hinders the determination of the social identity of the siderurgists. On some sites for regional or extraregional production, farmers today claim ownership of the smelting areas, but they often forget that they called upon the blacksmiths in the region to help them operate the furnaces.

During the creation of the object, magical knowledge had little impact on the skill of the blacksmith. He was completely responsible for his work, and recognised as such by all. This technical field was reserved for blacksmiths, distinguishing them from the cultivators. The transformation of iron into a finished object characterised their activity and earned them their title.

Table 2 - Social category involved according to status and stage in the siderurgical *chaîne opératoire* (data: C. Robion-Brunner).

		Farmer	Smith
Mining	Landholder		
	Possessor of magical knowledge		
	Possessor of technological knowledge		
	Labor		
Smelting	Landholder		
	Possessor of magical knowledge		
	Possessor of technological knowledge		
	Labor		
Smithing	Landholder		
	Possessor of magical knowledge		
	Possessor of technological knowledge		
	Labor		

	No evidence
	Little evidence
	Some evidence
	Much evidence

3.2 - Identity of the metallurgists' traditions (table 3)

The ethnohistoric data collected during our investigations into the identity of metallurgists from the Ouin, Fiko, Ama, Tinntam, Aridinyi and Wol traditions concern the period preceding the decline of this activity (18th and 19th centuries). For the earlier periods, it is difficult to acquire information and to transpose it onto later organisational systems.

It has not been possible to establish the link between the current Enndé populations and their siderurgical sites. It seems that the workshops have become disconnected from collective and individual memories. This perhaps indicates a tradition preceding the installation of the current Dogon villages, or a tradition belonging to siderurgists who have since left the region.

The local sources for the sites of Ouin tradition confirm that the possessors of magical and technological knowledge were blacksmiths belonging to the caste of the Jèmè-irin. The iron produced on these sites supplied primarily and almost exclusively the needs of the village near which the siderurgical workshop was established. This economy of self-sufficiency was based on the concept of non-profit exchange. This means that a part of the raw product belonged to the blacksmiths and that the other part to the landholder. The whole was transformed into finished objects, essentially agricultural tools. In return for the manufacture of these instruments, the blacksmiths received part of the harvest.

The cultivators and the blacksmiths of the sites of Fiko tradition lived close to the early siderurgical workshops, indicating that it was the farmers who operated the bloomery furnaces. The blacksmiths – Jèmè-irin – were not involved in this phase of the *chaîne opératoire*, being required only at the time of the removal of the raw product from the furnace and during the forging process. However, the blacksmiths interviewed in the neighbouring villages indicated that their forebears travelled seasonally to these sites to smelt iron ore. These apparently contradictory accounts cannot be analysed independently of the context of production and of the exchange networks. The sites of Fiko tradition are characterised by excess production intended to supply peripheral markets. The isolation of the resident blacksmiths resulted from the political and economic policy of the masters of the land. The Dogon, wishing to master the iron trade, would have excluded their artisans from this activity and called upon “external” blacksmiths for the work. In the Ama tradition, the magical and technological process was carried out by Jèmè-yélin blacksmiths. Their siderurgical activity seems to have been both regular and seasonal. It supplied the villages in which the workshops were established.

Table 3 - Social category involved according to status, the stage of the siderurgical *chaîne opératoire* and the siderurgical tradition (F: Farmer; S: Smith; data: C. Robion-Brunner).

		Ouin		Fiko		Ama		Tinntam		Aridinyi		Wol	
		F	S	F	S	F	S	F	S	F	S	F	S
Mining	Landholder												
	Possessor of magical knowledge												
	Possessor of technological knowledge												
	Labor												
Smelting	Landholder												
	Possessor of magical knowledge												
	Possessor of technological knowledge												
	Labor												
Smithing	Landholder												
	Possessor of magical knowledge												
	Possessor of technological knowledge												
	Labor												

In the Tinntam tradition, it was the Jèmè-irin blacksmiths, according to our investigations, who possessed the magical and technological knowledge. The sites that they exploited supplied a local market. To complement this production, the cultivators and blacksmiths of the region obtained iron and tools from workshops located further north (Niminiama, at the northern edge of the plateau) and to the south west (Aridinyi, Ségué, on the edge of the southern plateau cliff).

The possessors of magical and technological knowledge in the Aridinyi tradition were Jèmè-yélin blacksmiths. However, farmers could participate alongside them in all stages of the siderurgical process. At some workshops, such as that of Aridinyi, the blacksmiths and cultivators from the neighbouring villages and regions were involved. Once a year, these men produced iron, part of which was given to them in exchange for their work. The remainder was distributed between the village chief and the masters of the land, the mines and the furnaces. As the last workshops to have operated, they supplied the whole of the Dogon plateau, sometimes complementing iron from the west. In this way, the quantity of iron produced exceeded the needs of the villages in which the smelting sites were found; it satisfied a local and regional market.

In the Wol tradition, the farmers were the possessors of the spaces dedicated to the extraction and smelting of the iron ore. They also possessed the magical and technological knowledge necessary for exploitation. At no point in the different interviews has mention been made of the blacksmiths participating in the production of this metal. They are sometimes mentioned when we ask about the social identity of the people who transformed the raw iron into finished objects. The world of siderurgy was thus exclusively in the hands of the farmers, while the blacksmiths were marginalised. As in the Aridinyi tradition, the workshops of Wol tradition are among the latest to have been in operation. Also supplying the villages of the Seno plain and the cliff of Bandiagara, they answered a local and regional demand.

3.3 - Inventory of socio-economic systems

Following the classification developed by B. Martinelli (1992, 1993, 2000, 2002) from his research in Togo, Burkina Faso and Mali, we have arranged the Dogon siderurgical traditions according to three socio-economic systems: the “unitary” system in which the whole of the *chaîne opératoire* is controlled by the blacksmiths; the “mixed” system, in which the extraction and smelting operations are carried out equally by blacksmiths and farmers; and the “dualist” system, in which the cultivators supervise the extraction and smelting operations, and the blacksmiths process the raw product and transform it into finished objects.

The Ouin, Ama and Tinntam traditions were regulated by the “unitary” system. The cultivators were not prohibited from the siderurgical sites, but they were not present as a labour force, except at the forge. This system seems to have developed and been maintained in the context of local or regional production with a limited area of distribution of products.

The “mixed” system has been observed only for the Aridinyi tradition. This forms part of a double network of exchanges which is both local and regional. The area of distribution was extended, but does not seem to have exceeded the Dogon Country.

The Fiko and Wol traditions fall under the “dualist” system. For the Fiko tradition, this system seems to have developed on the basis of unitary or mixed systems which have evolved towards a dualist system due to an increase in the production of iron. The reasons for this increase and organisational change are the abundance of the ore in the region concerned, together with a geographical situation favourable to long-distance exchanges. Wol oral traditions do not make mention of any development or change in the identity of the siderurgists. It seems that this situation reflects the seniority in rank of the farmers compared to the other inhabitants of the region. The possession of land – rich in ore – and of siderurgical knowledge indicates their length of their territorial occupation and the geographical anchorage of their families in the region.

4 - The history of metallurgist settlement

The study of the socio-economic organisation of iron production in Dogon Country has shown differential involvement of the farmers and blacksmiths according to the status of the actors, the stage of the *chaîne opératoire* and the siderurgical tradition concerned. The situation seems to be complex and diverse. However, we can observe that the blacksmiths have occupied a specific role in the acquisition, manufacture and dissemination of iron and iron objects. We will now examine whether the history of the settlement of Dogon Country offers information on their professional activity.

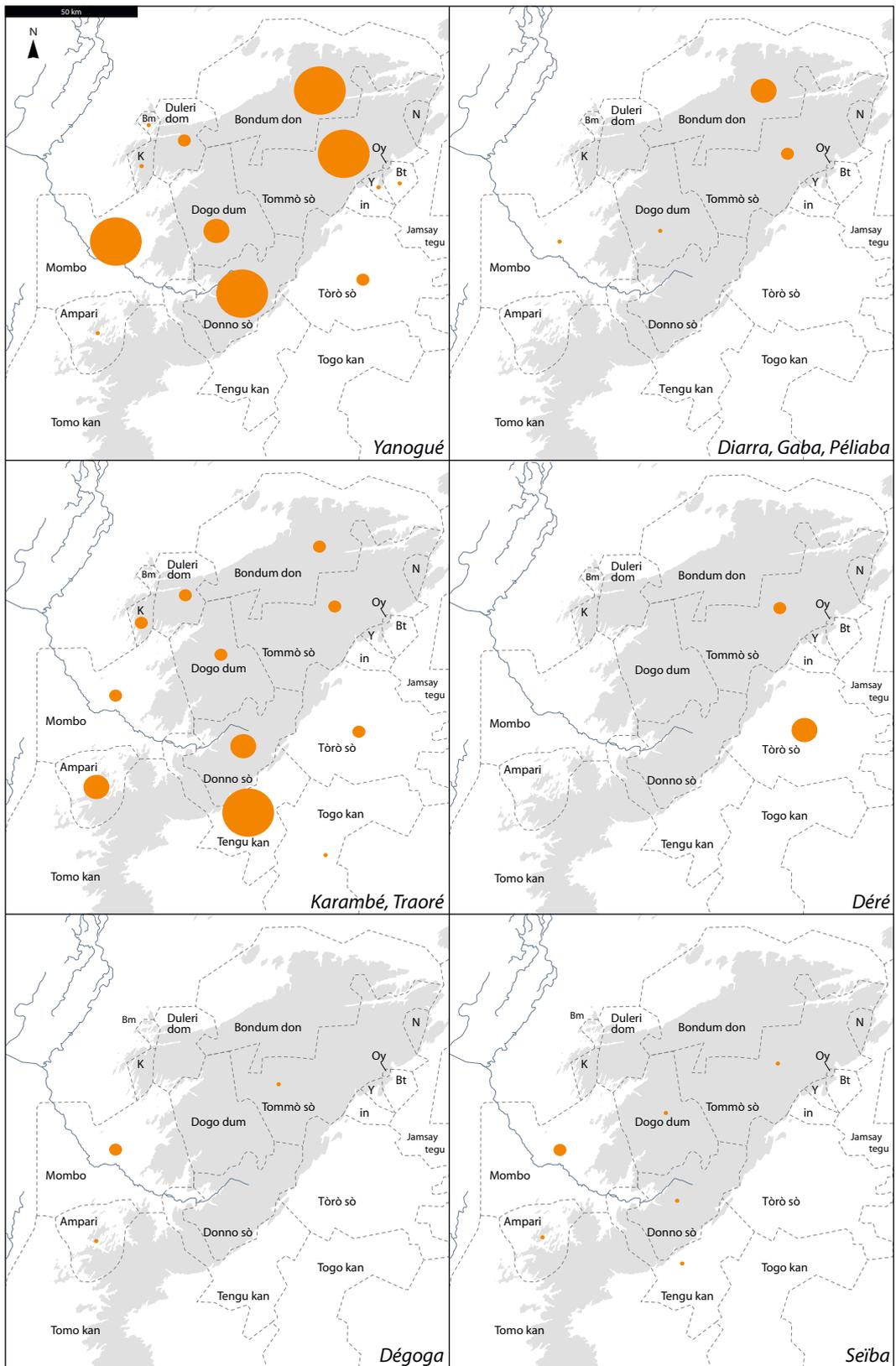
4.1 - Geographical distribution and linguistic insertion of the Jèmè-irin

The Jèmè-irin, currently established across the whole of the Bandiagara plateau and cliff, and in some villages on the plain of Seno, are not specifically associated with a linguistic zone (figure 1). They bear common patronyms which are encountered in other social categories. They obtained their family name from their farmer masters when they settled in the village. This transmission of the family name indicates an idea of matrimonial alliance and thus of an unbreakable link. A blacksmith who left his village to work elsewhere would prefer to choose an area in which a Dogon family with the same patronym was established. There is thus a close relationship between certain families of blacksmiths and farmers. However, over the centuries, changes in techno-economic partnerships have taken place and modified this initial attachment.

Eighteen patronyms have been identified among the Jèmè-irin. They occupy spaces of varying size and are distributed across different linguistic areas in very variable proportions (figures 7-8). For example, the Yanogué are ten times as numerous as the Sai. What does this numerical and geographical disparity signify?

4.2 - Implementation of a methodology enabling an examination of the migratory route of the blacksmiths

Having observed this disparity, we have attempted to reconstruct the history of each line of Jèmè-irin blacksmiths on the basis of historical accounts. According to the chronological system implemented by C. Sauvain-Dugerdil in the Dogon Sarnyéré, the duration of a generation has been estimated as thirty years (Gallay, Sauvain-Dugerdil, 1981). Individuals in generation g-1 were young adults in around 1975, those of generation g-2 in around 1945. We obtain the following sequence: g-3 around 1915, g-4 around 1885, g-5 around 1855, g-6 around 1825 etc. Genealogical memory thus enables the dating of the arrival of the blacksmiths in the villages currently occupied. The average length of residence in a village before displacement has been evaluated as 3.2 generations, with a minimum deviation of 1 and a maximum deviation of 5. Family trees and maps spatially reconstructing the dispersion of the Jèmè-irin according to their patronyms have thus been drawn up for six phases, interpreted as six centuries. This relative chronology enables us not only to trace the arrival and formation of the Jèmè-irin, but also to locate the regions of encounter of the different patronyms and to compare their age across the group. However, this approach in no way enables us to determine the date of arrival of the Jèmè-irin on the Bandiagara plateau. On the one hand, the evaluation of the gap between two generations is inexact, and on the other, during accounts of the migratory wanderings, the people interviewed mention the villages that became final destinations, but not necessarily all of the villages used as halts and/or passed through.



- Between 10 and 19 villages listed
- Between 5 et 9 villages listed
- Between 2 et 4 villages listed
- 1 village listed

Figure 7 - Maps of linguistic insertion of the patronyms Yanogué, Diarra, Gaba, Péliaba, Karambé, Traoré, Déré, Dégoga et Seïba (CAD: C. Robion-Brunner).

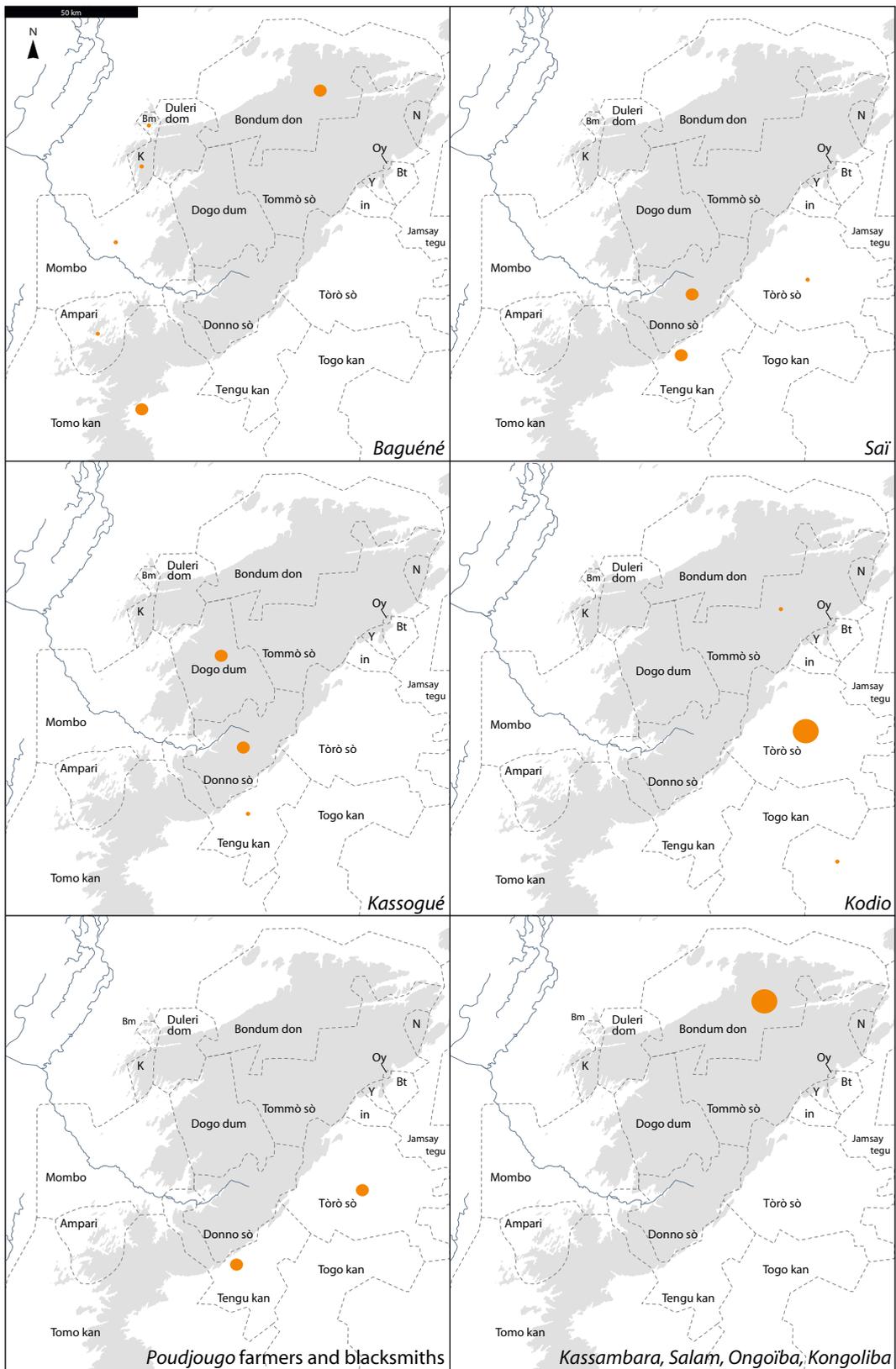


Figure 8 - Maps of linguistic insertion of the patronyms Baguéné, Saï, Kassogué, Kodio, Poudjogo, Kassambara, Salam, Ongoïba et Kongoliba (CAD: C. Robion-Brunner).

- Between 10 and 19 villages listed
- Between 5 et 9 villages listed
- Between 2 et 4 villages listed
- 1 village listed

4.3 - The Yanogu , detailed history of a migration

In order to illustrate the results obtained using our method for the acquisition and processing of ethnohistorical data, we present a detailed account of the settlement history of the family of blacksmiths currently most often encountered in Dogon Country. The Yanogu , present in twelve of the linguistic zones considered, are thought to originate from a lineage having arrived in Dogon Country from the west in the early 15th century. Its members then spread out to 50 villages, following 33 migration routes. [Figure 9](#) presents their history as far as it can be reconstructed from the information collected.

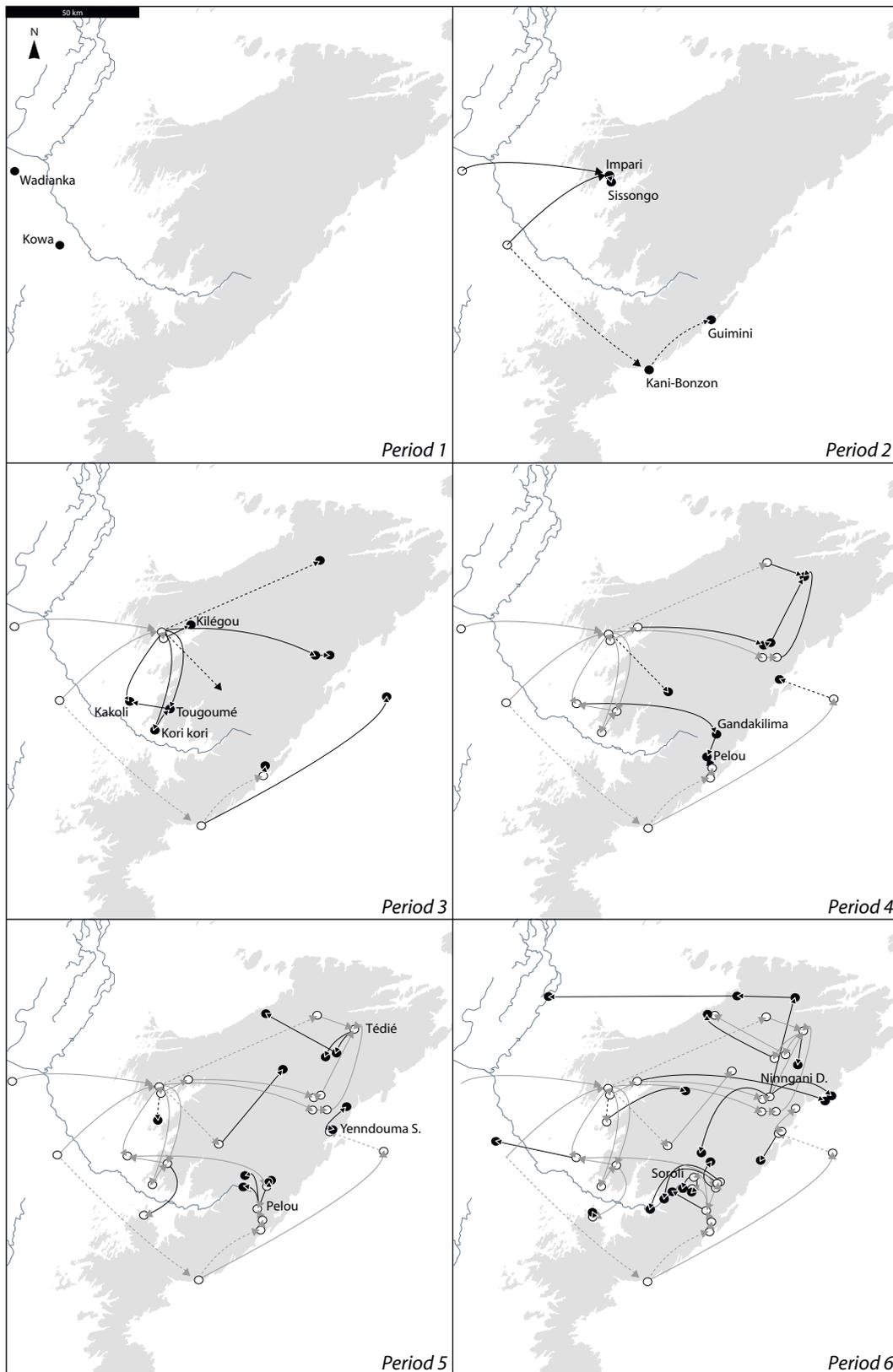
Leaving the Mand  region, the ancestors of the Yanogu  headed for S gou. From there, the route followed varies according to the blacksmiths' accounts. Some relate that their forebears settled at Wadianka before travelling to the north of the Bandiagara plateau, while others mention crossing the river Bani near Sofara, then their families settling in the village of Kowa, on the western margin of the plateau. At this point, their migratory route divided into two branches. The first moved towards the northwest to found the village of Impari. This location represents the memorial heritage of the Yanogu  blacksmiths. Movements then took place to the south – without crossing the Yam  – and towards the eastern part of the plateau. By settling at Kakoli, the blacksmiths found themselves in an area rich in iron ore. The second branch moved towards the plain, then from west to east along the cliff of Bandiagara. This route is less commonly mentioned by Yanogu  blacksmiths and concerns very few individuals. Their progress then continued towards the east, at the foot of the cliff and on the Seno plain.

The two migratory routes of the Yanogu  finally reunited in the region of Pelou. From the 19th century, and above all during the 20th century, the displacements of the blacksmiths accelerated: oral enquiries have recorded several settlements dating back scarcely one generation. This very recent expansion of iron artisans reflects the stabilisation of a postcolonial political context and coincides with the beginning of an ecologically more favourable phase in around 1945 (Mayor *et al.*, 2005).

5 - Proposed historical scenario

The analysis of the archaeological and ethnohistoric data (for more detail see Robion-Brunner, 2010) has resulted in the development of an historical scenario ([figure 10](#)).

- The archaeological investigations carried out in a variety of contexts – funerary (Bedeaux, 1972; Bedeaux, Lange, 1983; Bedeaux, 2003), habitation (Huysecom *et al.*, 2006, 2007; Mayor, 2011) and ritual (Mayor *et al.*, 1999; Mayor, 2011) – demonstrate that, between the 6th and 12th century, the plateau, cliff and plain of Seno were occupied by populations using iron objects. The excavation of several smelting sites located on the western margins of the Bandiagara plateau has shown that the technological process of iron smelting was also understood in this period (Huysecom *et al.*, 2009, 2010). The Dogon plateau has thus been the scene of early, dynamic and inventive siderurgical production. The radiocarbon dates obtained for the site of Fiko indicate a start of production in the 6th century AD, before the presumed arrival of the Dogon in the region (on this latter point, see Griaule, 1938; Dieterlen, 1966; Gallay *et al.*, 1995; Mayor, 2011).
- Today the myth of a single, large-scale arrival of the Dogon, around the 15th century, is widely contested (Bouju, 1984; Mayor *et al.*, 1999; Holder, 2001; Huysecom *et al.*, 2005, 2006 and 2007). Recent research shows several successive waves of settlement, between the 13th and 15th centuries, which led to a complex dynamic of local and external migrations. The Yanogu  migratory route shows that the blacksmiths arrived on the Bandiagara plateau via the margins of the delta, without passing through the mythical village of Kani located at the foot of the cliff.



Migratory paths
 — Direct path
 - - - Indirect path
 — Direct path of anterior period
 - - - Indirect path of anterior period

Villages of Yanogué smith
 ● During the present period
 ○ During the anterior period

Figure 9 - Spatial and chronological reconstruction of the migratory routes of the Yanogué blacksmiths (CAD: C. Robion-Brunner).

We have not been able to determine whether they accompanied or joined their Dogon “masters”. Their settlement in this iron-producing region did not lead to any notable technological changes. They seem to have adopted the Fiko tradition set up by the native populations.

- From the 16th century, the Dogon territorial expansion over the whole of the plateau and the cliff, linked to pressure by neighbouring states and to the reconquest of certain spaces, was undoubtedly the origin of a reflux of population towards Burkina Faso, but also of the incorporation of older populations into the Dogon population. The incorporation of these peoples with the status of “iron specialists” enabled them to be distanced from political and

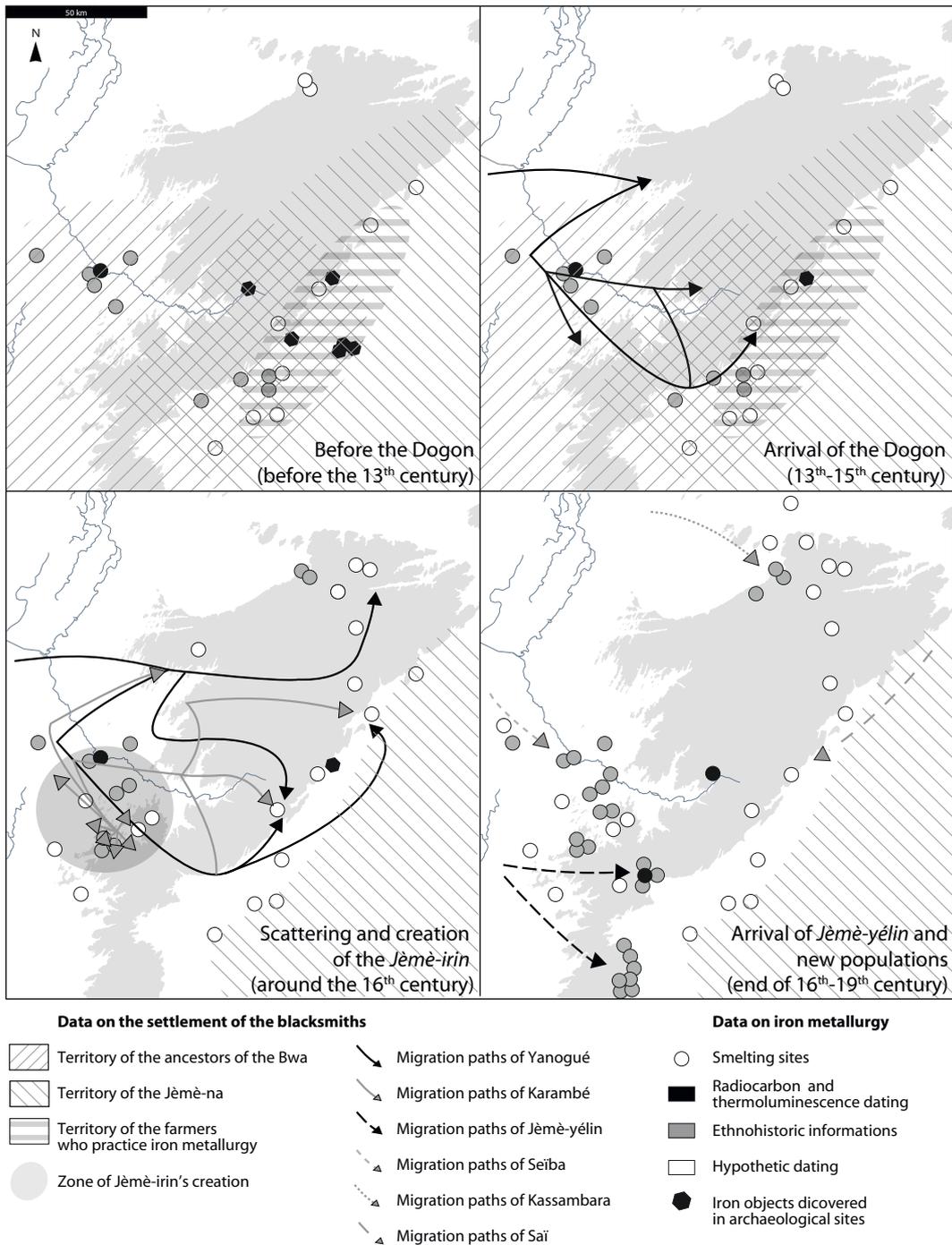


Figure 10 - Overview maps of the history of iron production on the Bandiagara plateau (CAD: C. Robion-Brunner).

economic power while granting them the ability to hold and manage particular fetishes and certain lands. The dispersion of the Dogon also had the consequence of increasing the need for iron and for blacksmiths. In order to satisfy these demands, several farmers' sons were designated to learn siderurgical techniques and to acquire the status of blacksmith. According to oral tradition, this training was carried out by the Jèmè-na. These stories of training may be interpreted as a request for authorisation addressed by the new arrivals to the native peoples, the keepers of technical and magical knowledge, but above all the holders of territory and thus of mineral resources. The social transformation of farmers into blacksmiths is certainly not a phenomenon fixed in space or time. It has probably taken place in several regions and several villages, and must have occurred repeatedly when the need for specialist artisans arose. The analysis of the migratory routes of the Yanogué and Karambé show dispersion and convergence of the routes of different families of blacksmiths towards areas of intensive production of iron (western margins). The stories evoke genuine siderurgical centres in which the blacksmiths gathered once a year to work together. These professional gatherings resulted in the constitution of the Jèmè-irin caste, or in other words in the integration within a single group of individuals with different ethnic and social profiles (native farmers, "transformed" Dogon farmers, Dogon and foreign blacksmiths etc.). This phenomenon is translated into the emergence of new siderurgical traditions (Ouin, Tinntam, Ama and Wol), which, despite a technical similarity, possess strong cultural particularities. We interpret these as the result of a process of identity individualisation.

- In the late 16th century, a new caste of blacksmiths, the Jèmè-yélin, settled on the southern plateau and in the western part of the plain of Seno. They were masters of the whole of the traditional production of iron and possessed a characteristic siderurgical tradition, named "Aridinyi" (Huysecom, 2001).
- The following period, the 18th and 19th centuries, is marked by several movements of population within the bend of the Niger. They follow the territorial expansion of the Bambara kingdom of Ségou, and the installation of the Peul Empire of Maasina at Hamdallaye. Noble populations and other castes and servile ranks took refuge on the Bandiagara plateau, and some of these migrants were integrated into the Jèmè-irin caste. This addition to the population does not seem to have led to any change in the field of iron production. Peul slaves trained in the arts of the forge at Wadianka settled close to Dogon families on the plateau and at the foot of the cliff. They took the name of "Seïba". Kassambara farmers accompanied by their blacksmiths fled King Da Monzon and took refuge among the northern cliffs of the Bandiagara plateau. From the northeast, Saï blacksmiths settled along the cliff.
- The 20th century saw the end of the traditional production of iron. Local iron was replaced by recovered and imported metal. The first sites affected were those located on the axes that penetrated the plateau, particularly the route linking Mopti and Bandiagara. It was not until the 1930s that the majority of local production halted, to be replaced by European iron. Only a few isolated sites continued smelting iron ore until the 1960s. Even today these workshops often benefit from a certain level of prestige. This halt in traditional iron production had a direct and indirect influence on Dogon blacksmiths. One aspect of their professional activity and their magical power dwindled. Their work became focused on the manufacture and repair of objects and was integrated into the market economy, modifying the social relationships at the origin of the farmer-artisan interdependence. Technical advances, the appearance on the market of industrially-manufactured products and the progress of monotheisms had a strong influence on the status of iron specialists and led to a degradation of their social position. Nevertheless, these technical, economic and social transformations took place at different rates depending on the development of the regions considered.

6 - Conclusion: the contribution of ethnohistoric data to the interpretation of archaeological data

In a general manner, it can be observed that the sites belonging to a given tradition are distributed across a restricted geographical area (figure 1). In the majority of cases, these regions correspond to distinct linguistic groups. The Fiko tradition appears in the area of the Mombo language, and so on. Only the Wol and Enndé traditions are present in several linguistic areas. The great variety of technologies encountered in Dogon Country seem thus to be explicable by means of cultural factors: each group has striven to maintain its own particularities in the construction of furnaces and their function. Technology, just like language, participates in cultural identity. While all furnaces functioned by natural draught, the Aridinyi tradition is distinguished by the formation of slag inside the furnace pit during operation. The slag in Enndé tradition is also formed within the furnace, but does not constitute a compact block; instead it forms masses of vertical cords. The other traditions use the technique of tapped slag. Furnaces of the Fiko tradition possess a very particular elliptical form while the other furnaces possess pit with circular cross-sections. To distinguish the other traditions, we must take into account the morphological particularities of the slag, the tuyeres or the construction of the furnaces.

The approach based on the description of the material remains results in a reasoned classification of the different sites and enables an assessment of their diversity. The explanation for this diversity, however, remains to be discovered. This technological diversity is clearly the reflection of the cultural diversity of Dogon Country, as is demonstrated by the links with the linguistic areas. But is the process leading to it linked more to the progressive accretion throughout the history of new populations in a refuge area or to local differentiation on the basis of a shared background? The Enndé tradition, the date of which is not yet confirmed, may represent an archaic industry corresponding to earlier settlement. The Ouin, Timtam, Ama and Wol traditions share the same background and may be variants resulting from local evolutions. The Fiko tradition would represent the culmination of a technological development underlain by the research for increased productivity in the context of a long-distance market. The Aridinyi tradition would then be an example of an external contribution.

The technological methods should not be approached only from a functionalist point of view, as this cannot alone explain the variability observed. The cultural and economic factors are thus essential when we wish to study siderurgical production as a whole. However, the current independence of the families of blacksmiths in relation to the areas defined by dialects demonstrates that a correlation between dialect and siderurgical tradition is not always relevant. In order to validate our approach and our observations, it remains for us to undertake a large-scale comparative investigation in other African contexts.

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